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Hydraulic Fill and Jetting as Effective Means for Preventing Backfill Settlement at Bridge Abutments and Trenches

Prepared for
WHRP Geotechnics Technical Oversight Committee

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Keywords: hydraulic fills, performance, jetting, backfill, trench, abutment, settlement, cohesive soil.

Summary

We found five citations for documents published in 1970 or later. One each was published in 2004, 2000, 1999, 1994 and 1970.

Citations

Links to online copies of cited literature are provided when available. Contact the WisDOT Library to obtain hard copies of citations.

Title: Optimum Methods of Trench Backfill
Author(s): Mclean, W. R.
Date: August 2004
Source/URL: *Public Works Journal Corporation*, Vol. 99, No 6, pages 101-103.
Description: 3 pages
Contents: Trench backfill has become an economic factor in the design of pipelines. This has resulted in the actual design of trench backfill. In 1953, the east bay municipal utility district, Oakland, California, adopted standard specification providing for the use of imported material or selected material from the excavation as directed by the engineer for trench backfill. The following year, a specification was adopted providing for Class I bedding for pipe, a Class I granular material up to the springline and selected material from the excavation from the springline to the surface. All of this material was compacted to 80 percent cal impact, but this latter specification has been improved and today compaction required is 90 percent to 95 percent cal 216. Standard specifications today for trench backfill of 16-inch and smaller mortar-lined and coated pipelines provide that the backfill material placed in that portion of the trench from the grade of the pipe to the level of 1 foot above the top of the pipe shall be approved material from the excavation, or Class III imported backfill material conforming to the following requirements: (1) the material must be free of roots, organic matter or other deleterious substances, (2) stones or lumps of material exceeding 4 inches in greatest dimension are not permitted, (3) the plasticity index shall not exceed 10, (4) the portion of the material which passes a 200-mesh sieve, expressed as a percentage and multiplied by the plasticity index, shall not

exceed 200, (5) the plasticity index shall be determined in accordance with the current ASTM method d 424, (6) material is brought up evenly on each side of the pipe and thoroughly jetted in place unless otherwise provided, and (7) the remaining portion of the trench shall be backfilled with selected material from the excavation. The district's standard specifications for trench backfill and imported materials are presented. They have become a part of all contract documents.

Title: Effects of Placement Method on Geotechnical Behavior of Hydraulic Fill Sands
Author(s): Sladen, J. A.
Date: October 2000
Source/URL: *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 126, No. 10, pages 942-944.
Description: 3 pages
Contents: A discussion of a paper with the aforementioned title by K. M. Lee, C. K. Shen, D. H. K. Leung, and J. K. Mitchell, published in this journal (Vol. 125, No. 10, October 1999), is presented. The issues raised in the discussion are largely concerned with the assessment of in situ sand density and the degree of confidence of the interpreted results. Discussion is followed by closure from the authors.

Title: Effects of Placement Method on Geotechnical Behavior of Hydraulic Fill Sands
Author(s): Lee, K. M.; Shen, C. K.; Leung, D. H. K.; Mitchell, J. K.
Date: October 1999
Source/URL: *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 125, No. 10, pages 832-846.
Description: 15 pages
Contents: Recently, large port and airport projects, together with other governmental and private projects in Hong Kong, required the use of large quantities of hydraulically placed marine sand fill. Concerns emerged among engineers about the effects of dynamic or transient loads on these fills, because the geotechnical performance of these sand fills in the past has not been observed and reported. Results of an investigation of the geotechnical behavior of a hydraulic sand placed at five land reclamation sites in Hong Kong are presented and interpreted. The study was conducted to aid in developing guidelines for quality control of hydraulic landfill placement. The work described consisted of field investigations, static and cyclic triaxial testing, and calibration chamber tests to study the cone penetration test versus relative density relationships for marine sands obtained from the reclamation sites. The results of this study clearly indicate that the placement technique is the single most important factor controlling the geotechnical behavior of a given type of sand when placed as a hydraulic fill. The weakest zone is generally located just beneath the water level where fill deposition is placed by pipeline discharge.

Title: Hydraulic Fill Performance in Hong Kong
Author(s): Shen, C. K.; Lee, K. M.
Date: March 1994
Source/URL: Report from Hong Kong Government, Geo Report Series, Geo Report No. 40, http://www.cedd.gov.hk/eng/publications/geo_reports/doc/er40.pdf.
Description: 200 pages
Contents: This report presents the results and findings of an investigation on "A Study of Hydraulic Fill Performance in Hong Kong" under the Agreement No. CE31/92 with the Civil Engineering Department of the Hong Kong Government. The final objective of this study is to develop guidelines for the Geotechnical Engineering Office for the quality control of landfill placement applicable to reclamation works in Hong Kong. This, as the self-contained first stage work covering a period of 12 months, was mainly a feasibility and exploratory study for the purpose of developing a pertinent and substantially broad data base for quality control of land reclamation. The scope of work for the one-year study included the following: (1) literature review on hydraulic fill placement, control and performance, (2) field investigation on a selected number of sites to gather relevant information, (3) laboratory testing of selected marine sands for reclamation in Hong Kong including the basic physical property determinations, and triaxial static and cyclic testing, (4) calibration chamber test to study the CPT Versus D relationship(s) for Hong Kong marine sands, and (5) preliminary assessment of the dynamic stability of hydraulic fills in Hong Kong.

Title: Hydraulic Fills to Support Structural Loads
Author(s): Whitman, Robert V.
Date: January/February 1970
Source/URL: *Journal of the Soil Mechanics and Foundations Division*, Vol. 96, No. 1, pages 23-47.
Description: 25 pages
Contents: Data are compiled based upon a review of the literature, concerning the relative density, penetration resistance, compressibility and rate of consolidation. Only hydraulic fills placed by sluicing through pipes are

considered, and emphasis is upon performance under ordinary dead and live loads. Fills are classified according to the nature of the borrow materials: (1) fairly clean sand, resulting in a reasonably uniform fill of moderate density; (2) silty or clayey sand, for inhomogeneous fill of large void ratio; (3) stiff cohesive soil, resulting in a skeleton of clay balls with a matrix of sand and clay; and (4) soft cohesive soil, resulting in a laminated normally consolidated clay. The characteristics of each type of fill are illustrated by a case study. The placement and engineering properties of the most desirable type of fill—that derived from a fairly clean sand—are considered in detail.